

## Far Infrared Spectroscopy of Nucleic Acids

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Abstract No. fran8792

Beamline(s): U2B

Hydrogen bonding interactions are crucial to the stabilization of the DNA double helix. The effects of periodic hydrogen bond pattern in repeat sequences are likely to give rise to defined low frequency modes in oligonucleotide models. As an example, adenine-thymine and guanine-cytosine dodecamers will be compared with poly-(dA) poly-(dT) and poly-(dG) poly-(dC) and with the alternating sequences poly-(dAdT) and poly-(dGdC).

The vibrational modes associated with hydrogen bonds fall in the far-infrared region ( $< 250 \text{ cm}^{-1}$ ). Thus, a comparison of the far infrared spectra of poly dAdT versus poly-dGdC provides a method for studying hydrogen-bonding interactions in DNA. We have studied films of with poly-(dA) poly-(dT), poly-(dG) poly-(dC), poly-(dAdT), and poly-(dGdC) and dodecamers of (dA<sub>12</sub>dT<sub>12</sub>) with isotopic labels. The films grown on polyethylene films at low salt concentration were extremely thin. We are developing new silicon cells for use in growing thicker films. We have also studied adenosine and two isotopomers <sup>15</sup>N(6) and <sup>15</sup>N(6), <sup>15</sup>N(9). There are noticeable isotopic shifts in these compounds. In addition we find evidence for significant anharmonicity. Analysis of these results is in progress using normal coordinate analysis tools. We plan to continue these studies with more extensive use of isotopically labeled compounds in order to assign the low frequency modes of both monomers adenine and adenosine, and DNA oligomers.